



Science Virtual Learning

MPI Physics 210

Thermodynamics 3: Thermal Expansion of Solids

May 11, 2020



Lesson: MPI Thermodynamics 3 - Thermal Expansion of Solids
May 11, 2020

Objective: To understand how solids expand when their temperature is increased

This video discusses how solids expand when their temperature is raised, or contract when the temperature is lowered.

<https://youtu.be/DMDCrfiJaqk>

Video: Thermal Expansion
of Solids



This video works out two examples using thermal expansion. See the following slides for a text version of the examples

<https://youtu.be/V6F5oNnHBlk>

Video: Thermal Expansion
Examples

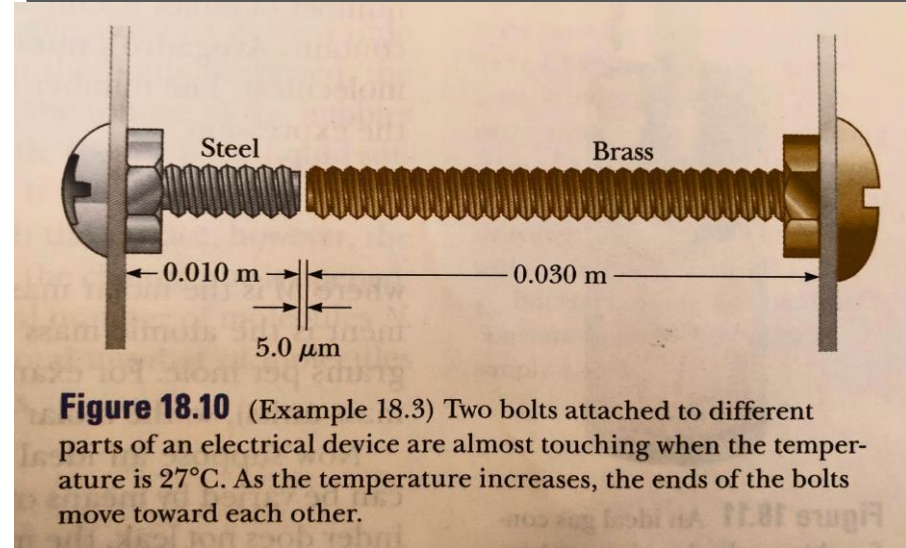


An aluminum thermos has a diameter of 8.00 cm and a volume of 0.700 L at 20.0 °C. It is then filled with coffee at 92.0 °C. How much does the diameter increase? How much does the volume increase?

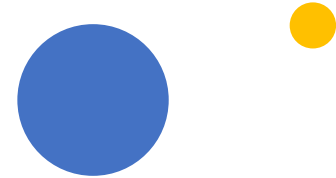
Expansion of Solids – Example 1



A 0.010-m long steel screw and a 0.030-m long brass screw are arranged so that their ends are only 5.0 μm apart at 27 $^{\circ}\text{C}$; see diagram. As you raise the temperature, the screws expand, closing the gap between them. At what temperature will the ends of the screws touch?



Expansion of Solids – Example 2



Homework 1

1. The Golden Gate Bridge is 1280 m long, and the structure is made of steel. By how much does the length of the bridge expand when the temperature increases from 5.0 °C to 27.0 °C?

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/ze_HKcrYrtE

Homework 2

2. A common demonstration of thermal expansion is the “ring and ball”. At $20.0\text{ }^{\circ}\text{C}$, the inner diameter of the ring is 20.0 mm , while the ball is slightly larger, at 20.1 mm . To what temperature must you heat the ring so that its diameter increases to 20.1 mm , so that the ball can fit through?



- Try to solve the problem yourself, then watch the solution video:
- <https://youtu.be/6T7uDpAI15Y>



That's it!

